REMARKS

Applicants have amended their specification in light of objections to the specification in Items 2 and 3 on page 2 of the Office Action mailed March 20, 2002. Specifically, typographical errors on pages 23 and 26 of the specification have been corrected, and, consistent with present U.S. Patent and Trademark Office practice, paragraphs including these corrections have been substituted for the original respective paragraphs in the specification. In addition, a new title has been submitted reflecting the subject matter of the present claims.

In view of amendments to the specification and the new title, it is respectfully submitted that the required amendments in Items 2 and 3 on page 2 of the Office Action mailed March 20, 2002, have been made.

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention, without amending the substance of the claims. Specifically, claim 9 has been amended to recite "a" first layered interconnection structure and "a" second layered interconnection structure. In light of this amendment to claim 9, it is respectfully submitted that the required correction set forth in Item 5 on page 3 of the Office Action mailed March 20, 2002, has been made.

Moreover, Applicants have amended claim 11 to recite that the plug faces the first copper film, the first neighboring film and a third barrier film adjacent the plug; and to recite that at least the second neighboring film and the second diffusion barrier film are located between the second copper film and the plug.

In addition, Applicants are adding new claim 12 to the application. Claim 12, dependent on claim 9, recites that the plug faces the first copper film, the first

neighboring film, the first diffusion barrier film and a third barrier film adjacent the plug; and that at least the second neighboring film and the second diffusion barrier film are located between the second copper film and the plug. In comparing claim 12 with claim 11, note that claim 12 recites that the plug faces the first diffusion barrier film in addition to other films.

The objection to claims 7 and 8 as being duplicates of claims 3 and 4, respectively, set forth in Item 4 on page 3 of the Office Action mailed March 20, 2002, is noted. In view of present canceling of claims 7 and 8, this objection is moot.

Rejection of claim 11 under the second paragraph of 35 USC 112, as being indefinite, set forth in Item 7 bridging pages 3 and 4 of the Office Action mailed March 20, 2002, is noted. It is respectfully submitted that in view of present amendments to claim 11, this rejection of claim 11 as being indefinite is moot. That is, it is respectfully submitted that relationships between the various components, and in particular positioning thereof, is clearly set forth.

The Examiner is thanked for the indicated allowability of claims 1-6. In view of the present amendments, it is respectively submitted that claims 1-7 and 9-12, all of the claims presently in the application, should all be allowed, and that the above-identified application should now be passed to issue.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current Amendment. The changes are shown on the attached pages, the first page of which is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

To the extent necessary, Applicants petition for an extension of time under 37 CFR § 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to the Deposit Account No. 01-2135 (Case No. 501.36931CX1) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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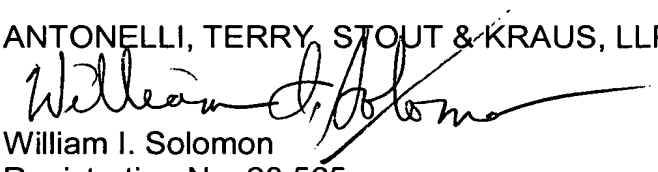

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please delete the paragraph from page 22, line 1 to page 24, line 5, and substitute therefor the following new paragraph:

In the third embodiment, at least one of the conductor film 117 as coated with the neighboring films 116a, 116b, and the conductor film 123 as coated with the neighboring films 122a, 122b shall be formed of a combination of materials that satisfies an inequality of $\{A + B \times (a_p/b_p)\} < 13$, where A indicates the difference between the short side, a_n, of the rectangular unit cells that constitute the plane with minimum free energy of the neighboring films and the short side, a_p, of the of the rectangular unit cells that constitute the plane with minimum free energy of the conductor film, and is represented as $\{ | a_p - a_n | / a_p \} \times 100 = A$ (%), and B indicates the difference between the long side, b_n, of the rectangular unit cells that constitute the plane with minimum free energy of the neighboring films and the long side, b_p, of the rectangular unit cells that constitute the plane with minimum free energy of the conductor film, and is represented as $\{ | b_p - b_n | / b_p \} \times 100 = B$ (%). This is for the purpose of retarding the diffusion of the conductor film so as to prevent voids that may be caused by so-called electromigration. Concretely, for example, where the conductor film 117 is a copper (Cu) film, the neighboring films 116a, 116b could be any one selected from the group consisting of a rhodium (Rh) film, a ruthenium (Ru) film, an iridium (Ir) film, an osmium (Os) film and a platinum (Pt) film. Since the conductor films 115, 120 for the plugs are adjacent to the conductor film 117, they could be considered as the neighboring films to the conductor

film 117. Therefor, where the conductor film 117 is copper (Cu) film the plugs 115, 120 could be any one selected from the group consisting of a rhodium (Rh) film, a ruthenium (Ru) film, and iridium (Ir) film, an osmium (Os) film and a platinum (Pt) film, by which the diffusion of the conductor film 117 is retarded to prevent voids that may be caused by so-called electromigration. In that constitution, since the rhodium (Rh) film, the ruthenium (Ru) film, the iridium (Ir) film, the osmium (Os) film and the platinum (Pt) film for the plug all have a higher melting point than a copper (Cu) film, the plug could exhibit an additional effect of such that its resistance against heat is higher than that of plugs of conductor films 115, 120 of being copper (Cu) films. In this case, it is desirable that the neighboring films, 114a, 114b, 119a, 119b to be adjacent to the conductor films 115, 120 are titanium nitride (TiN) films, as exhibiting good adhesiveness to the insulating films 113, 121. If the adhesiveness between them could be neglected, the neighboring films 114a, 114b, 119a, 119b may be omitted. Where the low level of electric resistance of the plug is regarded as more important than the resistance thereof against heat, a copper (Cu) film is used for the conductor films 115, 120 for the plug, and any one selected from the group consisting of a rhodium [(Rd)] <u>(Rh)</u> film, a ruthenium (Ru) film, an iridium (Ir) film, an osmium (Os) film and a platinum (Pt) film is used for the neighboring films 114a, 114b, 119a, 119b adjacent to the conductor films 115, 120. Though not shown in Fig. 8, any one or more additional layers may be formed between each of the neighboring films 116a, 116b, 122a, 122b, 114a, 114b, 119a, 119b and the insulating film adjacent thereto, as in Fig. 7.--

Please delete the paragraph from page 25, line 24 to page 27, line 18, and substitute therefor the following new paragraph:

Fig. 9 is referred to, which shows one preferred functional structure of the semiconductor device of the third embodiment. The structural difference between Fig. 9 and Fig. 8 is that, in Fig. 9, a neighboring film 126a is formed between the neighboring film 116a and the insulating film 113, a neighboring film 126b is formed between the neighboring film 116b and the insulating film 121, a neighboring film 127a is formed between the neighboring film 122a and the insulating film 121, and a neighboring film 127b is formed between the neighboring film 122b and the insulating film [121] 125. The conductor films 117, 123 to be interconnects are copper (Cu) films having a low electric resistance, in order that the device could have good capabilities for rapid operation. In order to make the copper (Cu) film interconnects have good electromigration resistance, the neighboring films 116a, 116b, 122a, 122b of diffusion barriers for the copper (Cu) films 117, 123 are ruthenium (Ru) films. The plugs 115, 120 adjacent to the copper (Cu) films 117, 123 are ruthenium (Ru) films so as to have good electromigration resistance. Electromigration resistance is especially important near plugs, for example, as in "Materials Reliability n Microelectronics", pp. 81-86 in Vol. 428 of *Symposium Proceedings of the Materials Research Society (MRS)*. The ruthenium (Ru) plugs have the advantage of good resistance against heat. In that constitution, the plug 115 and the diffusion barrier 116a are both ruthenium (Ru) films, and it is desirable to form these films both at a time as facilitating the film formation. Like those, the plug 120 and the diffusion barrier 127a are also both ruthenium (Ru) films, and it is desirable

to form these films both at a time as facilitating the film formation. In order to enhance the adhesiveness between the ruthenium (Ru) films and the insulating films adjacent thereto, the diffusion barriers 126a, 126b, 127a, 127b, 114a, 114b, 119a, 119b all are of a titanium nitride (TiN) film. In that constitution, the diffusion barriers 114a, 114b and the diffusion barrier 126a are all titanium nitride (TiN) films, and it is desirable to form these films all at a time as facilitating the film formation. Like those, the diffusion barriers 119a, 119b and the diffusion barrier 127a are all titanium nitride (TiN) films, and it is desirable to form these films all at a time as facilitating the film formation. Of those, at least one of the copper films and the diffusion barriers is formed at least through sputtering. It is more desirable that a film with low contact resistance, such as a metal silicide film or the like, is provided between the diffusion barrier 114a and the diffusion layer 104.

Please delete the present title, and substitute therefor the following new title:

--SEMICONDUCTOR DEVICE HAVING LAYERED INTERCONNECT STRUCTURE WITH A COPPER OR PLATINUM CONDUCTING FILM AND A NEIGHBORING FILM--.

IN THE CLAIMS:

9. (Amended) A semiconductor device comprising a first layered interconnection structure and a second layered interconnection structure, and a plug electrically connecting said first layered interconnection structure and said second layered interconnection structure,

wherein said first layered interconnection structure includes a first copper film, and a first neighboring film adjacent said first copper film and a first diffusion barrier film adjacent said first neighboring film, said first neighboring film having, as a primary constituent element thereof, an element selected from a group consisting of rhodium, ruthenium, iridium, osmium and platinum, and said first diffusion barrier film having at least one material selected from a group consisting of titanium nitride, tungsten and tantalum, and

wherein said second layered interconnection structure includes a second copper film, and a second neighboring film adjacent said second copper film and a second diffusion barrier film adjacent said second neighboring film, said second neighboring film having, as a primary constituent element thereof, an element selected from a group consisting of rhodium, ruthenium iridium, osmium and platinum, and said second diffusion barrier film having at least one material selected from a group consisting of titanium nitride, tungsten and tantalum.

11. (Amended) A semiconductor device according to claim 9, wherein said plug faces said first copper film, [and] said first neighboring film and a third [diffusion] barrier film adjacent said plug, and [said first neighboring film, said plug,] at least said second neighboring film and said second diffusion barrier film are located between said second copper film and said plug.